

Notice of Allowability

Application No.

10/599,059

Examiner

Thuy V. Tran

Applicant(s)

TAMITA ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 9/19/06 & prel. amendment conc. filed therewith.
2. ☒ The allowed claim(s) is/are 22-29.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date 09/19/2006
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____


THUY V. TRAN
PRIMARY EXAMINER

DETAILED ACTION

This Office Action is in response to the Applicants' communication filed on 09/19/2006 and preliminary amendment concurrently filed therewith. In virtue of this amendment, original claims 1-21 are canceled, claims 22-29 are newly added; and thus, claims 22-29 are now presented in the instant application.

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicants, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

This Examiner's Amendment is made to update the continuing data of the instant application based on the information provided by the Applicants, and to delete the equations numbers in the claims. It includes:

In the Specification:

Page 1, between the title and Technical Field, insert:

--This Application is a National Phase Application under 35 U.S.C. 371 claiming the benefit of PCT/JP04/15362 filed on 10/18/2004, which has priority based on Japan Application No. 2004-095248 filed on 03/29/2004.--

In the claims:

Claim 22, line 29, after the equation, "... (4)" has been deleted;

Claim 22, line 33, after the equation, "... (5)" has been deleted;

Claim 26, line 28, after the equation, "... (10)" has been deleted; and

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Claim 28, line 26, after the equation, "... (14)" has been deleted.

Reasons for Allowance

2. Claims 22-29 are allowed.
3. The following is an examiner's statement of reasons for allowance:

Prior art fails to disclose or fairly suggest:

* A plasma-generation power-supply device that drives a discharging load that generates a plasma, comprising a controller that is capable of controlling a frequency of an alternating output of said alternating-current power-supply, wherein said controller provides control to vary the power-supply frequency of said alternating-current power-supply in accordance with a target applied power to said discharging load, and said alternating-current power-supply is formed of an inverter, and said alternating output is a pulse output, and wherein when Cg: an electrostatic capacity value of a dielectric included in said discharging load, Ca: an electrostatic capacity value of a gas region included in said discharging load, Cp: a floating electrostatic capacity value in parallel with said discharging load, V*: a discharge maintaining voltage, L: an inductance value in a circuit including said discharging load, f: said power-supply frequency, and C β : an electrostatic capacity in a non-discharging state, then, said controller varies said power-supply frequency and a duty of said pulse output within a stable control region that is surrounded by: a characteristic curve of applied power that is obtained when said power-supply frequency is varied with said duty of said pulse output fixed at a maximum value; a curve representing 0.9 times a curve of an applied power Poz that is given by an expression below:

$$P_{oz} = 4C_g(V^*)^2 f \{ (C_g / (C_g + C_p - (1/L(2\pi f)^2)) - (1 + (C_a/C_g)) \}$$

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and, a straight line representing a resonant frequency f_{\max} in the non-discharging state that is given by an expression below:

$$f_{\max} = 1 / \{2\pi(\sqrt{LC\beta})\},$$

in combination with the remaining claimed limitations as called for in independent claim 22 (claims 23-25 are allowed since they are dependent on claim 22);

* A plasma-generation power-supply device that drives a discharging load that generates a plasma, wherein, when a ratio of said load voltage with respect to the output voltage of said inverter is defined as a voltage jump rate, C_g : an electrostatic capacity value of a dielectric included in said discharging load, C_a : an electrostatic capacity value of a gas region included in said discharging load, and C_p : a floating electrostatic capacity value in parallel with said discharging load, and a power-supply frequency of said alternating-current power-supply is set approximately equal to a resonant frequency of a circuit including said discharging load, and when a minimum value MOO of said voltage jump rate on a characteristic curve of said voltage jump rate with respect to said output voltage is defined by an expression below:

$$\begin{aligned} \text{MOO} &= \sqrt{2} \{ ((1+C_a/C_g)(1+C_p/C_g)-1/2) + \sqrt{((1+C_a/C_g)(1+C_p/C_g)-1/2)^2 - 1/4} \} \\ &\equiv 2\sqrt{2} \{ (1+C_a/C_g)(1+C_p/C_g) - 0.5 \} \end{aligned}$$

then, said load voltage is set to be larger than $\{\sqrt{2}/4\}\text{MOO}$ times said inverter's bus voltage and smaller than $\sqrt{2} \cdot (\text{MOO} + 2)$ times said inverter's bus voltage, in combination with the remaining claimed limitations as called for in independent claim 26 (claim 27 is allowed since it is dependent on claim 26; and

* A plasma-generation power-supply device that drives a discharging load that generates a plasma, wherein when a ratio of said load voltage with respect to the output voltage of said

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inverter is defined as a voltage jump rate, Cg: an electrostatic capacity value of a dielectric included in said discharging load, Cp: a floating electrostatic capacity value in parallel with said discharging load, Vd: a bus voltage of said inverter, and V*: a discharge maintaining voltage, then, a power-supply frequency of said alternating-current power-supply is set approximately equal to a resonant frequency of a circuit including said discharging load, and the bus voltage Vd of said inverter is set in a range defined by an expression below, as compared with said discharge maintaining voltage V*,

$$[4V*/\{1+Cp/Cg\}] > Vd > \{V*/2[1+Cp/Cg]\},$$

in combination with the remaining claimed limitations as called for in independent claim 28 (claim 29 is allowed since it is dependent on claim 28).

Any comments considered necessary by applicants must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Drawings

4. The drawings submitted on 09/19/2006 are accepted.

Information Disclosure Statement

5. The information disclosure statement (IDS) submitted on 09/19/2006 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Citation of relevant prior art

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6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Prior art Okamoto et al. (U.S. Patent No. 6,445,137 B1) discloses a dielectric barrier discharge lamp apparatus;

Prior art Okamoto et al. (U.S. Patent No. 5,936,358) discloses a dielectric barrier discharge device; and

Prior art Matsumoto et al. (U.S. Patent No. 5,932,116) discloses a power supply for multi-electrode discharge device.

Inquiry

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thuy V. Tran whose telephone number is (571) 272-1828. The examiner can normally be reached on M-F (8:00 AM -4:00 PM).

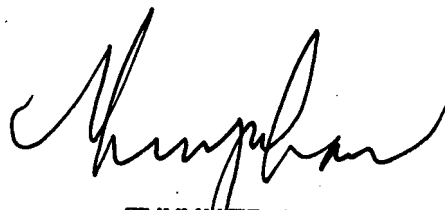
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Owens Douglas can be reached on (571) 272-1662. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

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like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

08/28/2007

A handwritten signature in black ink, appearing to read 'Thuy V. Tran', written in a cursive style.

THUY V. TRAN
PRIMARY EXAMINER